Learning with support of digital tools

6th National Meet&Greet of Swiss Medical Librarians

Learning digitally – ingenious or disastrous?

Sissel Guttormsen, 27.08.2018

Is the digital transformation, a surprise?

- National research programme (NFP), call 2017
  "*Herausforderungen der Digitalisierung für Bildung und Forschung in der Schweiz - Aktionsplan Digitalisierung*"
- Forum für Universität und Gesellschaft, November 2017
  DIGITALE WELT - Analoge Erfahrung
- June 2018, decision to introduce the Federal Licencing MCQ Exams, for human medicine on Tablet computers in 2021.
- Careum Dialog, January 2019 :
  „Digitale Transformation in der Bildung der Gesundheitsberufe".
- ...

Overview

Part I

Basics

What does it mean to learn?
Which are our limitations?
How can digital tools support?

Part II

Computer assisted learning

Insights
and examples from
from own research

1) What does it mean „to learn“?

A good advice can not be followed if it is not understood.
(Ladislaus Kuthy)

Tell me and I forget.
Show me and I remember.
Involve me
and I understand.
(Confusius)

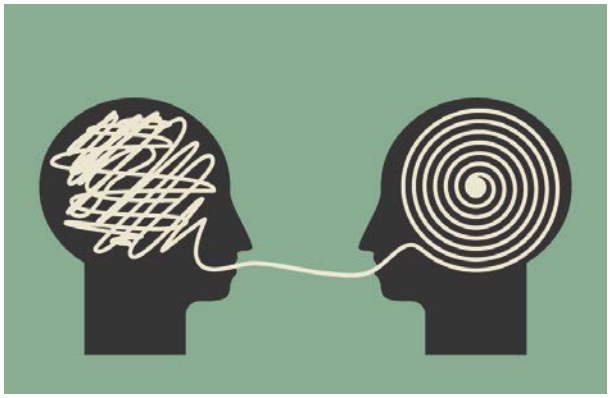
Excellence is never an accident. It is always the result of high intention, sincere effort, and intelligent execution...
(Aristoteles)

Forgoing thinking is intellectual bankruptcy
(Albert Schweitzer)

Learning theories offer different perspectives on learning

- Learning is a personal active process of constructing new insights by integrating new knowledge elements in already exsiting knowledge. *(Cognitive theories / Constructivism)*
- New knowledge and behavior can be acquired by observing and imitating others in a social context. *(Social Learning Theory, Bandura)*
- New skills can only be acquired through rewards and punishments of behaviour. *(Behaviourism / Operant Conditioning)*
- We learn meaning of concepts or constructs through interaction with others in a social context, and through interpretations of that world by actively constructing *meaning*. *(Social Constructivism)*

2) Which are our limitations?



Informationprocessing: *limited capacity*

- Support **attention** and **concentration**
  → Learning ist to undertand, this needs (*too*) much cognitive resources

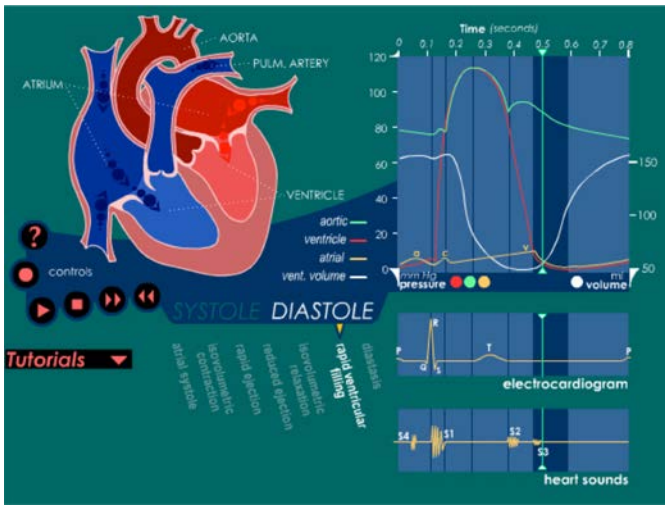
- Pay attention to the **amount of Information**
  → Too much information at once overloads the working memory.

- Make **meaningfull information chunks**

  7 ± 2

→ Sweller, J., Ayres, P., Kalyuga, S. (2011) *COGNITIVE LOAD THEORY,* Springer, New York, 2011, 274 pp., ISBN: 978-1-4419-8125-7
→ Mayer, R. (2009) *Multimedia learning***,** 2nd Edition, Cambridge, Cambridge University Press.
→ Miller, G. A. (1956). *"The magical number seven, plus or minus two: Some limits on our capacity for processing information". Psychological Review.* ***63*** *(2): 81–97. doi:10.1*

Avoid overloaded learning apps



Hyperheart:
http://library.med.utah.edu/kw/pharm/hyper_heart1.html

Information overflow

→> 20 complex concepts
Are these known?

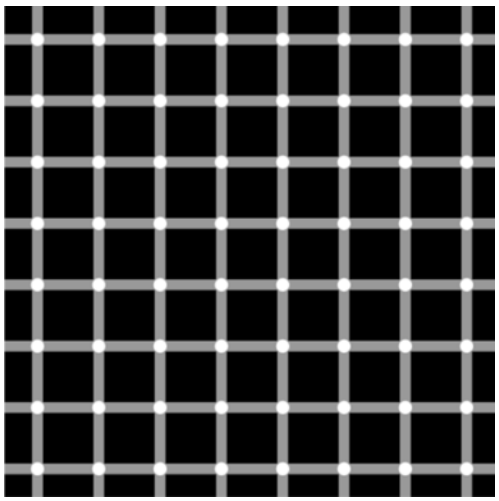
→> 10 differet colour codings
Differences recognised?

→Dynamic presentation
Information overflow?

→Complex relations
Relations observed and understood?

→Visual comparison of the processes
impossible...

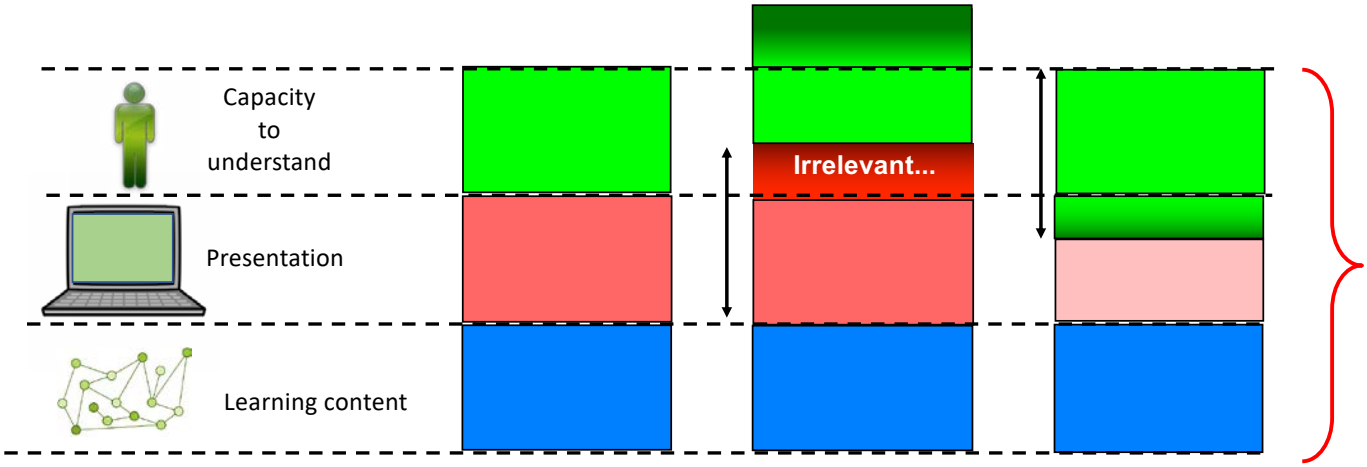
Information reduction !



Count the black points

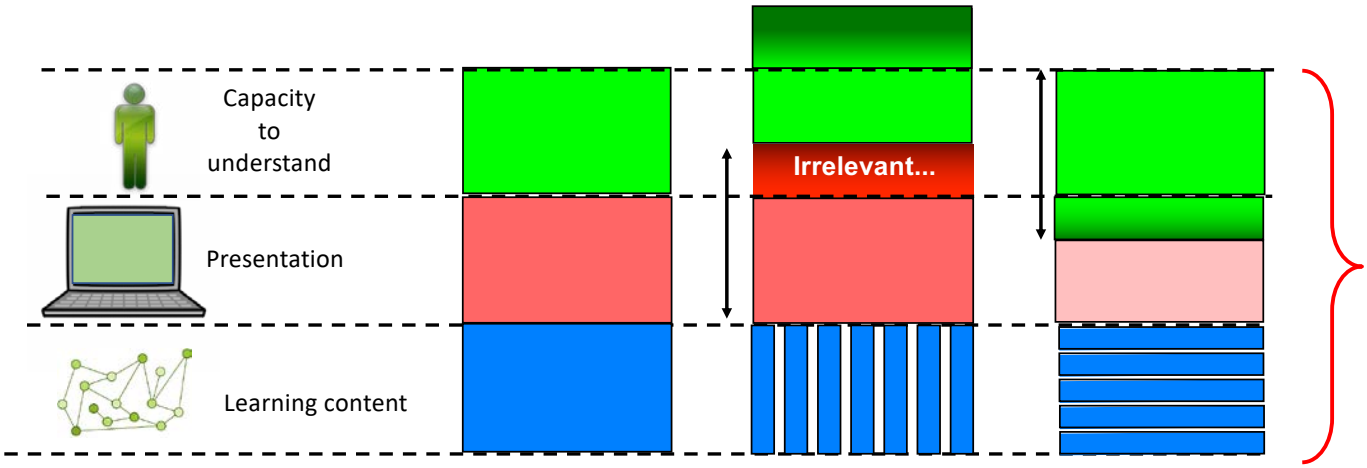
3) How can digital tools support learning?

Reduce the cognitive load: *Simplify presentations*



→ Sweller, J., Ayres, P., Kalyuga, S. (2011). *Cognitive Load Theory,* Springer, New York, 2011, 274 pp., ISBN: 978-1-4419-8125-7
→ Mancinetti, M., Guttormsen S., Berendonk Ch. (in print). Cognitive load in internal medicine. What every clinical teacher should know about cognitive load theory. *Europ J of Int Medicine*

Reduce the cognitive load: *Structure the learning content*



Make Chunks:

Afugrnud enier Stidue an der elingshcen Cmabrdige Unvirestiät ist es eagl,
in wlehcer Rienhelfoge die Bcuhtsbaen in eniem Wrot sethen,
das enizg wcihitge dbaei ist,
dsas der estre und lzete Bcuhtsbae am rcihgiten Paltz snid.

Der Rset knan ttolaer Bölsdinn sien und man knan
es torztedm onhe Porbelme lseen.

Das ghet dseahlb, wiel das mneschliche Geihrn
niciht jdeen Bchustbaen liset sodnern das Wrot als Gnaezs.

Overview

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Basics

What does it mean to learn?
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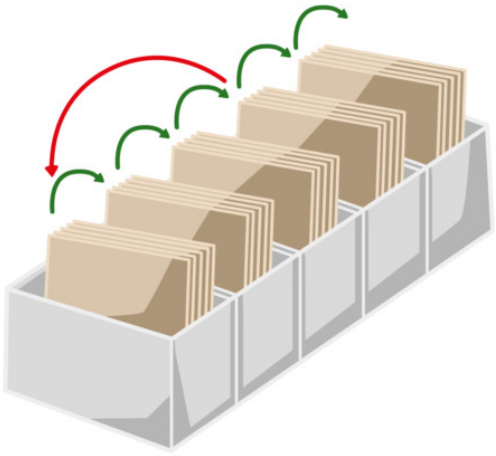
Support attention
Reduce information
Make information chunks

How important is the learning strategy?



Which strategies are successful?
...which factors are determinating?

Rational

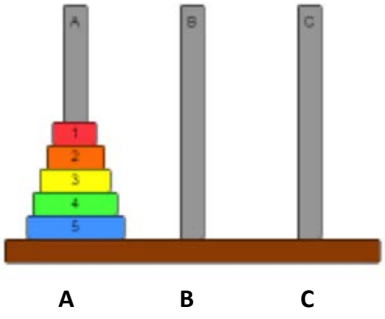
Well-defined task
Goal and Rules **known**.

Exploration

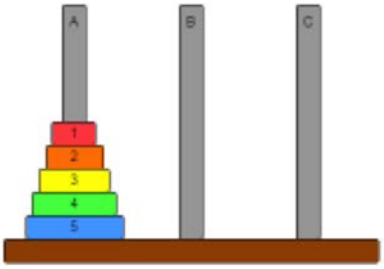
Ill-defined task
Goal and Rules **not known**.

Guttormsen Schär, S. (1996). The influence of the user interface on solving well- and ill-defined problems. *International Journal of Human Computer Studies* 44, 1, 1-18

Task:
Learn the rules of the ‚*Tower of Hanoi*‘



The *interaction method* influenced the learning strategy



2 X ***minimal steps*** < 20 trials

11.67
65

 # Trials
 # Errors
Same time

17.4
250

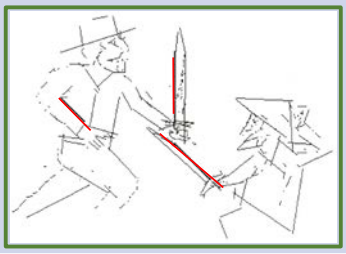
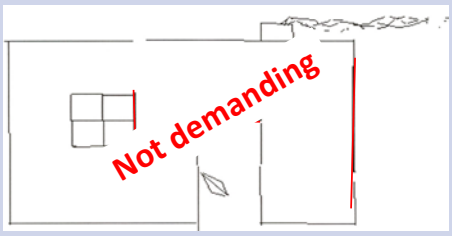
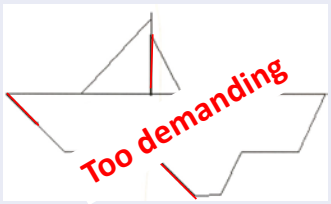
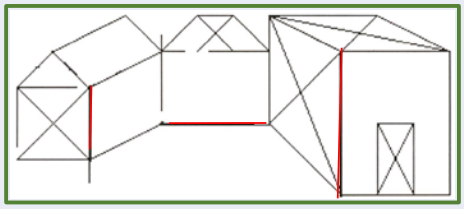
... the thinking stopped as soon as the participants had a computer-mouse in the hand
→ A rational learning strategy is a benefit for rule-based tasks

Which strategy is sucessful for creative tasks?

Creative task	Draw something of your own choice, name it	Draw a house	
	original complex aesthetic	original complex aesthetic	Exploring
	original complex aesthetic	original complex aesthetic	Rational
	Criteria	Criteria	

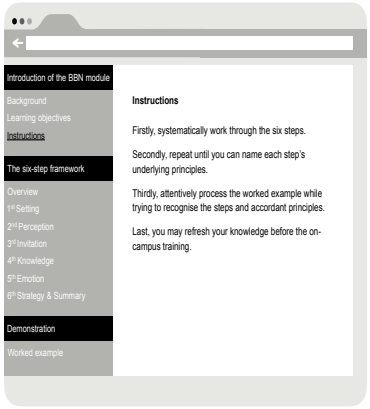
?

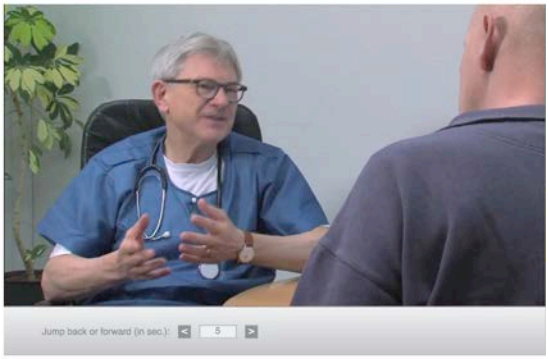
The *interaction method* influenced the result

	Open Task	Closed task
Mouse		
Keyboard		

Can complex social skills
be acquired from computer learning?

Communication training *for health professionals*





Transfer to praxis

1 **Learning theory**

Understood ?

2 **Video:**
Observe role model

Combine theory with example?

3 **Practice**
communication skill

Correct implemented?

Which didactical means sind effective?

\+

\+

Prompts for reflection:

Correct or wrong?

\+

Feedback:

Explanation

Theory / Basic information

Eroneous vs. correct examples

Connect theory + example

Stimulate thinking / reflection...

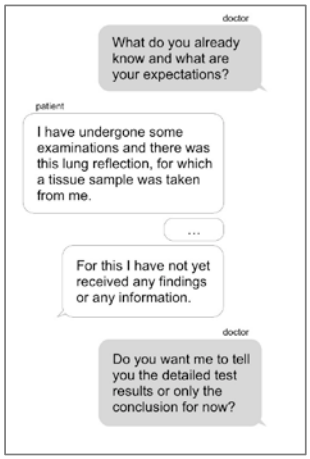
Learning with **erroneus examples** had **positive impact** on practical skills

Schmitz, F. M., Schnabel, K., Stricker, D., Fischer, M. R., & Guttormsen, S. (2017). Learning communication from erroneous video-based examples: A double blind randomised controlled trial. PEC, *Patient Education and Counseling.* http://dx.doi.org/10.1016/j.pec.2017.01.016

Exploring use of videos for Learing...

F.M. Schmitz*, K. Schnabel* (*authors contributed equally), D. Bauer, C. Bachmann, U. Woermann, **S. Guttormsen**, The learning effects of different presentations of worked examples on medical students' breaking-bad-news skills: A randomized and blinded field trial, *Patient Educ Couns* (2018), https://doi.org/10.1016/j.pec.2018.02.013

Which presentation form is better?



← **Reading dialogue**
(Sufficient?)

See and hear
(Attention?) →

Annotated dialogie
(too much/ , overload'?) ↓

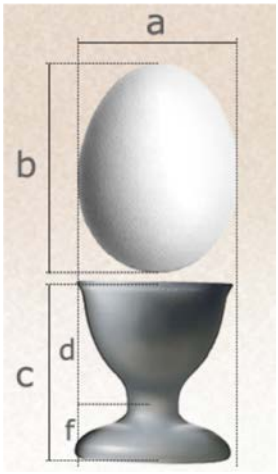
Stimulate reflections

Learning digitally – ingenious or disastrous?

“The big picture”: Digital transformation in education

- Cognitive ergonomics **+** classical *usability*
- User-centred vs. Technology driven
- Learning design is an interdisciplinary task
- Technology without didactics is lost endaveour

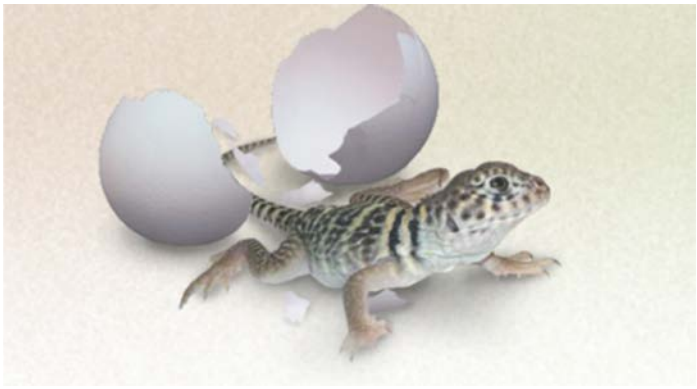
Rather simple and ingenious than complex and disastrous



Technical innovation + meaningfull implemetation

→ De-accelerate learning with new media ...
→ Constructive allignment of learning objective and presentation...
→ Enable knowledge building in small steps...
→ Details are important!
→ ... Also a theoretical fondation.

Learning with support of digital tools is exiting.



Thank you for your attention!